BOOK REVIEWS

Strong Interaction Physics

Edited by W. Rühl and A. Vancura ; Springer-Verlag, Pp 405, Price U.S. $ 8.90.

Strong Interaction Physics is one of the volumes in *Lecture Notes in Physics* series edited by J. Ehlers, K. Hepp, and H. A. Weidenmuller. This volume is prepared under the collection of lectures on the strong interactions of elementary particles with emphasis on the theoretical investigations delivered in the International Summer Institute on Theoretical Physics is Kaiserslautern 1972. These lectures cover mainly two major fields—*mathematical methods in analyzing scattering amplitudes and light-cone singularities respectively conformal inveriance in quantum field theory.* There are sixteen lectures delivered as

(*i*) *High Energy Experiments* based on paricle production, elastic scattering and total cross-sections are discussed by A. Minten, CERN.

(*ii*) G. Höhler of Institut für Theoretische Kernphysik der Universität Karlsruhe, Germany has delivered the lecture on πN *Scattering amplitudes at Intermediate and High Energies.*

(*iii*) *Optimization of Collision Amplitudes under Constraints*—the methods are illustrated with the application to collision amplitudes at asymptotic and finite energies by R. J. Eden, Cavendish Laboratory, Cambridge.

(*iv*) D. Atkinson of Institute for Theoretical Physics, Groningen has talked on *A Theoretical Investigation of Phase-Shift Analysis* which is discussed the analysis to energies above the inelastic threshold.

(*v*) Sorin Ciulli, Institute for Atomic Physics, Bucharest, Romania has delivered the lecture on *Stability Problem in Analytic Continuation.*

(*vi*) The present structure of the experimental data and recent attempts to describe it and a realistic absorption model are discussed by G. L. Kane of Michigan University in his lecture on *Phenomenological Study of Two-Body Hadron Scattering.*

(*vii*) Henry D. I. Abarbanel, NAL, Batavia has shown how to approximate a three-dimensional motion to one dimensional one in his lecture on *Eikonal Approximation Technique in Elastic Scattering and Production Process.*

(*viii*) An alternate calculational tool from the usual Feynmann approach and the connection between ordinary field theory and light-cone-formalated field theory are discussed by Ralph Roskies of Pittsburgh University in his lecture on *Field Theory at Infinite Momentum.*

(*ix*) Talks of M. Toller, CERN in *Some General Aspects of Multiperipheral Dynamics* with some improvements in the 0(3, 1) projection of the multipheral integral equations based on the properties of a semi-group are noted here.

(*x*) I. T. Drummond of Cambridge has devoted his time in *Lecture Notes on Dual Amplitudes* based on the generalization of Veneziano's Betafunction model for two-particle scattering.

(*xi*) Lecture of H. Leutwyler, CERN on *Currents on the Light-Cone* has been discussed with an introduction to some of the topics in light-cone physics mainly to electron-proton scattering.

(*xii*) On *Conformal Invariant Quantum Field Theory*, I. T. Todorov of JINR, Dubna has described briefly the manifestly conformal covariant technique and the invariant two- and three-point functions by a systematic use of conformal inversion invariance and the absence of ultraviolet divergences in the skeleton graph expansion.

(*xiii*) A survey of the bootstrap approach to construct a conformal invariance quantum field theory is given by G. Mack, BERN, Switzerland in his lecture on *Conformal Invariance and Short Distance Behavior in Quantum Field Theory.*

(*xiv*) A. F. Grillo, CNEN, Italy has discussed the consequences of conformal invariance on vacuum expectation values of local operators with some remarks concerning field theoretical models in two-dimensional space-time in *Kinematical Aspects of Conformal Invariance.*

(*xv*) The operator in perturbation theory has been reported by W. Zimmermann of New York University in *Operator Product Expansions.*

(*xvi*) The last article of this book is *Application of the Normal-Product Algorithm to Zero Mass Limits, Broken Symmetries and Gauge Fields* prepared by B. Schroer, Berlin.

Finally, we can say that this book is useful to the present workers of the above field for ready references.

T. R.

Thermodynamics of Crystals

by D. C. Wallace, John Wiley and Sons, 1972. Pp xviii+484, $ 22.50.

'*Thermodynamics of Crystals*' by D. C. Wallace is an important contribution to the literature on lattice dynamics and thermodynamics of perfect crystal. Wallace states his intention of writing the book and the scope within which it is written quite clearly in his preface. The intention is to describe the basic theory of the crystals starting from the description of crystals as a collection of interacting ions and electrons and carrying this theory to the point where one can finally describe and relate the observable properties. Obviously this is a stupendous task, and the scope of the properties dealt with must be limited. Wallace limits himself to only those properties that are obtained in the presence of externally applied homogeneous stress, while leaving out the interaction with external electric and magnetic fields. The book does not cover magnetic, piezo-

electric and magnetostriction properties. However, the elastic properties that are dealt with are fairly well covered. The great merit of the book is its emphasis in presenting the theoretical formalae in a manner that is amenable to experimental tests, and on clear cut methods for analysing the experimental data for purposes of comparison to theory. Though the books starts from basic notions that should be familiar to an M.Sc. student, it deals with the most advanced topics in the subject. It gives one a detailed account of anharmonic effects, both in theoretical treatment and in analysis of experimental data. The theoretical analysis in the book goes for beyond the force constant models and gives a detailed account of crystal potential in terms of band structure and dielectric constant.

There are a few shortcomings of the text. Firstly it is not easy reading, because of somewhat confusing notation and the cluttered style in which equations are written. The book seems to be swarming with equations without enough physical arguments to illuminate the mathematical reasoning. Inspite of the claim of the author regarding the self containedness of the book, the book is not suitable for the first exposure.

By subject matter the book may roughly be divided into three parts. The first part consisting of four chapters begins with a review of thermodynamics and culminates with the description of thermodynamic properties in terms of phonons. In the first part, the thermodynamics is followed by a detailed account of elasticity theory and theory of sound propagation. Here the reviewer felt that the point group symmetries of the lattice, that play a significant role in the analysis of elastic constants were not adequately discussed. The second chapter deals with the crystal potential and develops the familiar theory of potential energy expansion in terms of ion displacements. The method of homogenous deformation is also described and the two approaches are compared. The third chapter is the central chapter in the book. Here the eigenvalue problem for the harmonic phonons is first discussed and then methods for treating anharmonic effects are given. The theory of self-consistent phonons is also described. Chapter IV deals with the thermodynamic function that are derived from the phonon theory. Chapter V and VI form the second part of the book. Here the problem of deriving the crystal potential in terms of the electron wavefunction within adiabatic approximation is tackled. The crystal potential is related to band structure and a formulation involving dielectric function is given. The pseudopotential theory is also described. The last two chapters are devoted to critical analysis of existing experimental data and some model calculation. Counting everything this is a good book for research workers in the area of lattice dynamics. The reader planning to study the book should prepare himself for a bit of hard work, but it should prove well worth it.

S. K. J.